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TITLE: Exploration of difficulty accessing the mouths of intubated and mechanically ventilated adults for oral care: A video and photo elicitation study

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CONFLICT of INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

Conception and design of the study: CD, JA, SS, SD, LR; Data acquisition, CD, LR; analysis and interpretation of data: CD, JA, SS, SD, LR; Drafting the article or revising it critically for important intellectual content: all authors. CD is the guarantor of the paper, taking responsibility for the integrity of the work as a whole, from inception to published article.

ABSTRACT

Aim: Our aim was to explore descriptors of difficulty accessing the mouths of intubated and mechanically ventilated adults for oral care, consequences, modifiable antecedents, and recommendations for improving care delivery.

Background: Nurses report oral access and care delivery difficulty in most mechanically ventilated patients.

Design: A prospective qualitative descriptive design.

Methods: Data were collected using video and photo elicitation interviews focused on delivery of oral care. Directed content analysis was used to explore descriptive categories. Reporting utilized the SRQR guidelines.

Setting and participants: A university-affiliated hospital in Toronto, Canada. Participants included clinicians experienced in accessing the oral space of adults representing nursing, medicine, dentistry and allied health professionals.

Findings: We recruited 18 participants; 9 representing critical care, 9 other specialties frequently accessing the mouth i.e. dentistry. Descriptors for observed difficulty accessing the oral cavity were ‘oral crowding with tubes’ and ‘aversive patient responses’, which were considered to result in insufficient oral care. Participants perceived aversive patient responses (e.g., biting, turning head side-to-side, gagging, coughing) as a consequence of forced introduction of instruments inside a crowded mouth. A key finding identified by participants was the observation of substantial procedural pain during oral care interventions. Potentially modifiable antecedents to difficult oral care delivery identified were procedural pain, oral health deterioration (e.g., xerostomia), and lack of interprofessional team problem solving. Recommendations to address these antecedents included patient preparation for oral care through verbal and non-verbal cueing, pharmacological and non-pharmacological strategies, and ICU interprofessional education.

Conclusions: Oral care in mechanically ventilated adults is complex and painful. Visual research methods offer important advantages for oral care exploration including its ability to reveal less visible aspects of the nurse-patient encounter, thereby enabling novel insights and care.

Relevance for clinical practice: Interprofessional education and training in oral health and care interventions tailored to mechanically ventilated patients are recommended.

What does this paper contribute to the wider global clinical community?

- This study is the first to use video and photo elicitation interviews to explore difficulty accessing the mouths of intubated and mechanically ventilated adults for oral care.
- A study strength is the inclusion of a diverse group of participants representing both critical care and healthcare professionals with considerable experience of oral care external to critical care.
- Results highlight the importance of procedural pain assessment and management during oral care.

Key words: intensive care units; mechanical ventilation; oral care; oral health; patient-oriented research; procedural pain; qualitative research; video recording.

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INTRODUCTION

Oral health is essential to overall health, disease prevention, and health-related quality of life (Glick et al., 2016). Unfortunately, critical illness and its treatment contribute to rapid oral health deterioration (Terezakis, Needleman, Kumar, Moles, & Agudo, 2011). Emergent oral health problems include xerostomia, mucositis, device-related pressure injury, as well as fungal and bacterial overgrowth (Dennesen, Ven, Vlasveld, & Lokker, 2003). Insufficient or ineffective oral care may lead to local disease (e.g., gingivitis, root caries, tooth loss). In addition, systemic disease (e.g., ventilator associated pneumonia [VAP], sepsis) may result from translocation of oral bacteria to the lower airways (Hellyer, Ewan, Wilson, & Simpson, 2016). Oral health deterioration during intensive care unit (ICU) treatment contributes to the burden of critical illness with consequential impact on the duration of ICU stay and costs of treatment (Sands et al., 2017).

While oral health problems during mechanical ventilation are considered avoidable (Celik & Eser, 2017), more than 80% of ICU nurses report difficulty accessing the oral space for preventative oral care (Dale, Smith, Burry, & Rose, 2018). Technical difficulties include poor visual and instrument access to the mouth due to obstruction by tubes. Behavioral difficulties include patient inability to cooperate by holding the mouth open during oral care (Jongerden et al., 2010). Technical and behavioral difficulties impede delivery of recommended care processes including tooth brushing, application of moisturizers and saliva replacements, oropharyngeal secretion removal, and administration of VAP prophylaxis (e.g., selective oral decontamination) (Price, MacLennan, Glen, & SuDDICU Collaboration, 2014). Given the highly prevalent nature of oral access difficulty, investigation to identify potential interventions to overcome such difficulty is urgently needed.

BACKGROUND

Nurses need a broad knowledge base to enable skilled appraisal and management of the effects of serious illness and its treatment on their patient's oral health. This warrants evidence drawn from a wide range of research approaches. In spite of this understanding, knowledge of nursing oral care delivery has been primarily accrued through surveys (Dale, Angus, Sinuff, & Mykhalovskiy, 2013). This distal approach to practice may lead to incomplete knowledge of the difficulties nurses confront in practice. Technical and behavioural problems which are not described in sufficient detail may lead to the development of oral care interventions which are difficult to replicate or unacceptable to patients.

Sharpening a focus on fundamental nursing care requires reflection on the designs traditionally used for inquiry (Richards, Hilli, Pentecost, Goodwin, & Frost, 2018). Qualitative approaches may be particularly useful in the investigation of oral care as they can clarify how care is delivered and experienced. For example, qualitative observations engage deliberate reflection upon real-world patients, practises, and care contexts, thereby generating a more holistic understanding (Iedema, 2019). Similarly, qualitative interviews propose an important opportunity to learn from those with knowledge of the phenomenon (Sullivan-Bolyai, Bova, & Harper, 2005). Despite its recognized advantages, qualitative methods have not been applied to oral access difficulty.

As part of a program of research into improving oral care in the critically ill, our aim was to use qualitative observations and interviews addressing technical, behavioral, and combination (technical and behavioral) difficulty to better understand oral access problems by fulfilling the following primary objectives:

1. Explore terminology used to describe oral access difficulty, differences among healthcare professionals experienced in the delivery of oral care interventions within and external to the ICU, and perceived consequences;
2. Identify potentially modifiable antecedents to difficulty in the delivery of oral care and professional recommendations for future interventions.

A secondary objective was to affirm the benefits of video and photo data in the exploration of oral care delivery.

METHODS

Design

We employed a prospective qualitative descriptive design (Sandelowski, 2000). Qualitative description (QD) represents a constructivist epistemology whereby diverse participant experiences are valued for their ability to provide new insights regarding a poorly understood phenomenon. A key characteristic of QD is low inference interpretation (Kahlke, 2014). This positions QD as useful when aiming to offer a rich descriptive summary and preserve the language of participants. When applied to nursing-related phenomena, QD often seeks to understand the complexity of patient care as a basis for improvement (Kim, Sefcik, & Bradway 2016).

To enhance the richness of data required in QD, we employed two forms of data collection. The first comprised video and photographic observation of oral care delivery in patients demonstrating technical and behavioural difficulty. The second entailed elicitation interviews which incorporated review of video and photographic data (Harper, 2002). In

presenting familiar events (e.g., oral care) in an unfamiliar way (e.g., video review), elicitation interviews leverage a process called defamiliarization (Abildgaard, 2018). This entails the disruption of habitual perceptions in order to examine taken-for-granted events in a new light. The benefits of visual elicitation for exploring care problems includes more in-depth discussion, recall, and reflection when compared to standard interviews (Barton, 2015).

Setting

The study was set in a 20-bed medical-surgical-trauma ICU of a university-affiliated hospital in Toronto, Canada. The study unit provides advanced life support for 1200 patients annually. Nurses are assigned to care for mechanically ventilated patients using a 1:1 or 1:2 ratio.

Participants

We prospectively recruited three orally intubated and mechanically ventilated patients (>18 years of age) for video and photographic observation. Patients were eligible if they fulfilled screening criteria for one of the following oral access difficulty categories: (A) technical difficulty [oral crowding due to the presence of ≥ 1 oral tube and/or glossitis]; (B) behavioral difficulty [≥ 1 aversive behavior during oral care]; and (C) combination difficulty [both (A) and (B) difficulty categories] confirmed by two bedside nurses. Patients unable to received standardized oral care were excluded. Recruitment continued until we identified one patient fulfilling each category.

We purposively recruited nurses, physicians, allied health therapists and dental professionals representing diverse experiences, education, and accountabilities in the delivery of oral interventions (e.g., placement of oral tubes, swallowing assessment, feeding, and preventative oral care). In response to calls for greater interprofessional collaboration in oral

health (Hein, Schonwetter & Iacopino, 2011), we recruited clinicians both within and external to the ICU in order to collect multiple perspectives and enable comparison of differences in the use of language (Polkinghorne, 2005).

Procedures

We photographed anterior, lateral, and basal face and intraoral aspects of each patient. Video recordings captured delivery of a standardized oral care protocol including: 1) oral examination with a flashlight; 2) brushing the teeth, tongue, and gums; 3) rinsing the mouth with sterile water; 4) delivery of an antimicrobial rinse; 5) deep suctioning to remove pooled oropharynx secretions; and (6) application of lip balm. Patient demographics and treatment characteristics were collected from the health record.

Health professionals completed a demographic questionnaire and participated in one interview conducted by the lead author. During each interview, participants sequentially reviewed the three patient cases including clinical history, still photographs, and video recordings. A semi-structured interview guide was used to prompt dialogue concurrent to image review. Interviews were digitally audio-recorded and transcribed verbatim. Recruitment continued until no new information was received (Polit & Beck, 2012).

Ethics

Hospital and university research ethics boards approved the study. Due to the incapacities associated with critical illness and its treatment, written consent for recorded care observation was initially received from a surrogate decision-maker and then each patient following their recovery. With respect to patient anonymity and confidentiality, we provided options for de-

identifying facial features and restrictions on future use of video and photographic images. Clinicians provided written informed consent prior to participating in an interview.

Data analysis

We conducted a directed content analysis of interview transcripts as it supports low inference interpretation associated with qualitative description (Hsieh & Shannon, 2005). It does so through manifest analysis which aims to describe the obvious and preserve participant language. We modified an approach described by Bengtsson (2016) to reduce the volume of data and organize it according to previously defined concepts. The first phase involved refinement and testing of a code book addressing a priori categories of oral access difficulty terminology, consequences, modifiable antecedents, care recommendations, and the perceived benefits of video and photo data (Dale, Smith, Burry, & Rose, 2018). The second phase involved two team members independently coding each transcript, generating reflexive memos, and meeting to discuss coding correspondence and key differences in ICU and non-ICU participant statements (Elo et al., 2014). In the third phase, word frequencies were reviewed to further clarify group differences in language, identification of modifiable difficulty antecedents, and practice recommendations. In the forth phase, findings were compared to the existing literature, thus enabling understanding of how the research contributes to a larger body of knowledge. NVivo 10 qualitative software was used for coding and storage of data (Richards, 2005). We used the Standards for Reporting Qualitative Research (SRQR) guideline to ensure transparent reporting of the study (O'Brien, Harris, Beckman, Reed, & Cook, 2014). See Supplementary File 1.

RESULTS

The three patient case participants were primarily female (66.6%), with a mean age of 66 (SD 16.3) years, and orally intubated for an average of 13 days (SD 9.1) at the time of data collection. Patients were unable to communicate using non-verbal means and all had received analgesia on the day of observation. Figure 1 displays de-identified examples of facial and intraoral photographs. Mean duration of each oral care video was 6.8 (SD 1.51) minutes (Figure 2).

Eighteen health professionals (9 ICU and 9 non-ICU clinicians) participated in a 90 minute elicitation interview. Most were female (94%), held a baccalaureate degree or higher (89%), and had been working in their designated profession for six or more years (94%). Physician, nursing, physiotherapy, and dietary professionals were recruited to both ICU and non-ICU representative groups. Speech language pathology, occupational therapy, and dental health professionals were unique to the non-ICU participant category as they do not routinely consult on mechanically ventilated patients in the study hospital (Table 1).

We present our results based on the following directed content analysis categories: interprofessional descriptions of oral access difficulty, consequences, and differences among healthcare professionals; potentially modifiable antecedents; recommendations to improve oral care delivery; and, perceived benefits of video and photographic data (Table 2).

Interprofessional descriptions of oral access difficulty, consequences, and differences among healthcare professionals

Participants perceived endotracheal and feeding tubes, their securement devices, and the oral cavity's anatomical contents (e.g., inflamed tongue) to occupy excess space inside and around the mouth such that visualization and instrument access to the oral space were problematic. Oral

‘access’ difficulties due to ‘crowding with tubes’ were common terms employed during interviews:

> *“There isn’t really a ton of access to the mouth which is I think posing the biggest problem. It’s crowded.” [Occupational Therapist]*
>
> *“It’s hard to get around these tubes.” [Dental Hygienist]*

A commonly identified outcome of oral crowding was insufficient oral care delivery:

> *“In terms of the completion of oral care, I am not sure how much the nurse was able to access in terms of the palate, the posterior oral cavity, and the tongue dorsum.” [Speech Language Pathologist]*

Prominent differences were noted in descriptive language and focus between the two professional groups. For example, non-ICU participants (e.g., speech language and occupational therapists; dental professionals) more frequently employed expert terms for oral conditions (e.g., xerostomia, macroglossia, recession, motor apraxia) and emphasized risk for infection-related oral health deterioration (e.g. gingivitis, caries, periodontal disease) due to insufficient oral care:

> *“We’d definitely say that there is macroglossia, you know because the tongue is large there. You know there’s xerostomia because it’s very dry.” [Dental Hygienist]*
>
> *“I am worried about cavities. By this point they look like they are going to [survive]. So we should start looking at their quality of life. You don’t have very good quality of life if you have no smile or no ability to chew.” [Speech Language Pathologist]*

In contrast to a focus on dental health, ICU participants more frequently drew attention to oral care for the prevention of VAP during mechanical ventilation:

> *“It’s all geared towards VAP now and not cleaning the teeth and things like that.” [ICU Nurse]*

Terms to express difficulty with delivery of oral care commonly used by ICU professionals were less scientific and more descriptive in nature. For example, two ICU nurses explained how the intensity of oral access difficulty would be expressed in professional exchanges such as shift handover:

> *"I think what clinicians would pass along to each other would probably include words like 'challenging' or 'difficult'". [ICU Nurse]*

Communication of difficulty intensity was deemed important as oral crowding often warranted 'blind' passage of tools, expressed as the forced introduction of an instrument into the mouth without direct visualization of the oral cavity:

> *"This poor person providing mouth care is just looking for a little access somewhere. You need to put a little more pressure to go in and then you do it blindly." [ICU Nurse]*
>
> *"It looked like a bit of pressure behind the delivery of all those things." [Respiratory Therapist]*

A consequence of blind instrument passage was aversive patient responses. Participants explained how instruments could unintentionally land on inflamed tissues or initiate airway reflexes, which elicited sudden movement of the patient's mouth, head, or body during oral care:

> *"She's having to try to force her way into his mouth clearly. He's shaking his head then he's clamping down and just turning his head away. "[Physician]*
>
> *"If you hit closer to the back, it's really going to make [the patient] feel like she's going to gag. You can see that's why she had a reaction. She is in distress." [Dentist]*

Participants remarked upon a wide range of aversive patient responses including gag and cough reflexes, mouth closing, biting, turning the head side-to-side, and attempts to localize to the nurse

or instrument. Aversive responses were understood to communicate an unwillingness or inability of the patient to cooperate during oral care, thus intensifying oral access difficulty.

Modifiable antecedents to oral care difficulty

Modifiable difficulty antecedents identified by participants included procedural pain, oral health deterioration (e.g., xerostomia), and the absence of interprofessional collaboration to resolve oral access difficulty (Table 2).

A key modifiable difficulty antecedent was procedural pain. Observed oral lesions combined with aversive patient responses were recognized by participants to signal the need for better pain management. Those who were not directly involved in consulting on ICU patients expressed surprise by the observation of pain behaviors:

> *"I see dried cracked lips. I see bloody red upper gums. And a lot of coating on the tongue with chunks of dried debris. That is going to hurt during oral care." [Speech Language Pathologist]*
>
> *"You could clearly tell that the person was distressed. They would have a high behavioral pain score." [Occupational Therapist]*

Behaviors such as "grimacing", "head turning", and "biting" were considered indicative of pain:

> *"That Yankauer went into his mouth he grimaced immediately. Yeah he's trying to withdraw from that so obviously it's very uncomfortable and painful." [ICU Nurse]*

Poor oral health states, obviously visible in the oral photographs, were considered an important source of pain, and therefore, contributing to aversive patient responses:

> *"It's horrifying actually to see what that looks like inside there. Your tongue isn't usually dry like that. So that in itself is a source of discomfort.*" *[Nurse]*

Dental health professionals and speech language pathologists most frequently identified dryness as a modifiable source of pain compared to other participants. One dentist explained how dry inflamed tissues contribute to rapid nociception, otherwise known as a heightened sensitivity to pain:

> *"Well you know that sensory diagram of people with their mouths and their tongues they're huge, right, and the motor pathway between the nerve cells in your tongue and your teeth and your lips and your brain is very, very, very short. The reaction in an inflamed mouth is quick and intense." [Dentist]*

Most participants perceived procedural pain as a key source of difficulty associated with delivery of oral care, however some expressed concern that oral health problems, including pain, were given insufficient attention in practice:

> *"I must have missed tons of terrible mouths in my patients that I never looked at. And you know this is part of how bad it can get. It should be part of the daily assessment. You know, remind people that it might well be part of a daily issue. Right? Like we almost never discuss this on rounds." [ICU Physician]*

Participants perceived insufficient attention to oral care in practice, including discussion on interprofessional team rounds, precluded collaborative identification of possible solutions.

Recommendations to improve oral care delivery

We categorized participant recommendations to improve oral access and patient comfort as: (1) communication with patients using verbal and non-verbal cueing; (2) pharmacological and non-pharmacological interventions; and (3) formal oral health education to advance knowledge and skill in oral care delivery.

With regards to communication with patients through verbal and non-verbal cueing prior to inserting instruments, participants described verbal step-by-step guidance as an essential component of "patient-centered" preparation, regardless of cognitive capacities. This approach comprised a simple explanation of what would happen prior to each step of oral care:

> *"Explain what you're going to do. So it's not like they're sleeping and all of a sudden something gets shoved into their mouth. So you prepare them. And if they can understand you, maybe that will make it a little easier for you. And I think one of the other things we can do is tell them how long it will last or when we will be done." [ICU Nurse]*

A second recommended component of cueing involved the non-verbal strategy of moisture application to the lips and anterior mouth. Application of a moisturizing agent was described as the initial physical step to an "anterior to posterior" approach:

> *"I start at the lips. So just kind of like giving a little bit of moisture on the lips, um, for, you know for those patients who are not fully alert or oriented. That's how it starts. So go from anterior to posterior." [Speech Language Pathologist]*

This non-verbal strategy included an assessment of the patient's behavioral response to oral stimuli. If present, aversive patient behaviors offered an opportunity to diagnose and treat those behaviors, prior to proceeding with oral care.

Recommendations for use of pharmacologic and non-pharmacologic approaches to improve visualization and instrumental oral access included a moisture product applied to the lips and anterior aspect of the mouth, as noted above, for patient comfort:

> *"You see the [tongue] tissues there, there's no moisture on them; they look pebbly and dry. You'd want to lubricate them first before you did any cleaning. So that they stretch and they slip. The tissue is very thin; you don't want to abrade it." [Dentist]*

As the placement of instruments on dry inflamed tissues may generate pain, moisture application (e.g., sterile water or a commercially available moisturizer) was considered an indispensable strategy. Additionally, in line with current professional society recommendations (Devlin et al., 2018), many participants endorsed provision of pre-procedural analgesia or sedation in patients demonstrating recurring pain or agitation behaviours during oral care:

> *"I'm curious to know if you have any pain medication on board for this patient. As beneficial as mouth care is, it doesn't seem that way. It didn't seem like it was patient focused. Maybe because he didn't look comfortable at all." [Nurse]*

Use of pharmacological strategies was considered essential to reduce pain and distress, thereby minimizing behavioral impediments to oral care.

The most common non-pharmacological strategy recommended by participants to improve oral access was a mouth prop, i.e., a device placed in the dental arch when working with patients who lack motor control or are otherwise unable to hold their mouth open voluntarily:

> *"We do have things called props which we pop in one side of somebody's mouth if they aren't able to stay open. And it gives us better access while we work on the other side. And then we can switch it over." [Dental Hygienist]*

A prop was deemed advantageous in increasing visual and instrument access to the mouth and reducing the need for forced introduction of instruments. A suitable prop was described as strong enough to resist biting pressure, thereby keeping the teeth apart, but also flexible enough to avoid discomfort. While similar numbers of ICU (9; 100%) and non-ICU participants (9; 100%) recommended a tool to prop open the mouth, ICU participants described limited access to such tools.

The third recommendations for formal education on oral health and care delivery for all members of the ICU interprofessional team was deemed important as oral health problems in the observed patient cases were seen as highly complex, therefore requiring a broad range of knowledge and skills:

> *"Standardized training would be very important. Standardized training for the basic patient and then troubleshooting for the not so easy patient." [Physician]*

With the exception of dental and speech language professionals, participants identified a lack of oral health curriculum in their undergraduate education. Table 3 summarizes key recommendations to improve oral access and patient comfort.

Perceived benefits of video and photographic data

Participants considered video and photographic data as a powerful method of exploring and understanding oral access difficulty due to its ability to foreground an issue often given inadequate attention. For some, video and photographs exposed previously unseen or unarticulated dimensions of the nurse-patient encounter:

> *"I learned a lot. I mean how sick people are, how many tubes there are, and how complex this is. Something like brushing your teeth should be simple but it's not." [Occupational Therapist]*

A particularly satisfying property of video and photographs for participants was its ability to accelerate understanding of a complex care delivery problem. For some participants, visual data overcame potential problems of miscommunication or misapprehension, especially for those without professional experiences in critical care.

When comparing and contrasting the benefits of video and photographs, facial and intraoral photos were noted for their capacity to deliver rich diagnostic information. For example, several participants credited intraoral photography for their ability to recognize oral health problems such as xerostomia. In contrast, most participants identified video as the best method for understanding oral care delivery:

> *"I think the still photographs are good to give that sense of what that mouth cavity looks like. But the video gives that pain response; their reaction. The hurried or non-hurried nature of what the nurse is doing. All of those things that you couldn't communicate with a still photograph. So even if you had a still photograph of a clinician doing oral care you couldn't get the same sense of 'no I can't get into the mouth' even with the tiny suction catheter." [ICU Physician]*

In addition to a method of learning about the technical delivery of oral care, video highlighted the human dimension of such procedures during critical illness, providing the opportunity to consider the patient experience. Furthermore, some participants reported an unexpected emotional response due to visualization of pain and suffering associated with oral care delivery:

> *"I felt compassion for these [patients] and also for the caregivers because I can see what a challenge this is. I would say just seeing the acuity of the patients is distressing. I think about them being somebody's family member. They're a human being and at the moment it doesn't seem humanizing, you know. As for the [nurses], I just got a new appreciation for their job." [Dietitian]*

An empathic response was manifest for some participants in an expressed desire to collaboratively resolve oral access difficulty and improve patient outcomes:

> *"[The video] really prompts me to think about what can be done for this patient. And it's good for brainstorming." [Speech Language Therapist]*

In summary, participants recognized multiple benefits of video and photographic data in the exploration of oral care difficulty, including its ability to highlight complexity and patient experience and to enhance understanding and foster creative recommendations.

DISCUSSION

In this first video and photographic elicitation study of difficulty accessing the mouths of intubated and mechanically ventilated adults for oral care, a key finding identified by participants was the observation of substantial procedural pain during oral care interventions. Similar to prior research, we found oral crowding with tubes and aversive patient responses to result in insufficient oral care (Dale, Angus, Sinuff, & Rose, 2016; Jongerden et al., 2010). Findings include important differences in ICU and non-ICU health professional oral health communication and training (Hein, Schonwetter, & Iacopino, 2011). Potentially modifiable antecedents to difficult oral care delivery identified were procedural pain, oral health deterioration including xerostomia, and lack of interprofessional team problem solving. Recommendations to address these antecedents included patient preparation for oral care through verbal and non-verbal cueing, pharmacological and non-pharmacological strategies, and ICU interprofessional education.

Our participants identified procedural pain as a key modifiable antecedent of oral access difficulty. Study findings extend recent evidence of routine oral care as an important source of procedural pain (Ayasrah, 2016). Low levels of saliva during critical illness (Dennesen et al., 2003) and intubation contribute to oral tissue inflammation (Puyo, Peruzzi, Earhart, & Roller, 2017). Oral pain occurs as a result of activation and/or sensitisation of nociceptors on peripheral nerve fibres by inflammatory mediators and by mechanical and thermal stimuli (Miaskowski C,

2001). Results underscore the importance of pain management during routine ICU procedures (Puntillo et al., 2014) and further emphasizes the need to improve clinical appraisal of pain during oral interventions (Dale et al., 2018).

We found ICU and non-ICU participants to employ different language and focus when describing oral health problems and the purpose of preventative oral care. Non-ICU participants more frequently identified xerostomia and dental decay as important targets for care improvement. In contrast, ICU participants emphasized VAP prophylaxis as a central rationale for oral care during mechanical ventilation. Sources of these discrepancies may arise from differences in undergraduate and graduate training (Hein, Schonwetter, & Iacopino, 2011). Limited education on oral health in non-dental professional training may impede recognition of common oral health problems, interprofessional communication using appropriate terminology, research measurement, and the development of clinical practice guidelines. These circumstances also serve to highlight opportunities for integrating oral health competencies in nursing, medicine, and allied health professional training (Dolce, Holloman, & Fauteaux, 2016).

In line with prior studies, we observed video observation to creatively engage clinicians in problem-solving care difficulties (Iedema, 2011). By positioning study participants as experts, elicitation may introduce topics and perspectives not anticipated by researchers. While visual methods have been formally applied to studies outside healthcare, this research method is relatively new in critical care. The critically ill require complex health interventions, thereby necessitating the combined expertise of multiple professions. As dental health experts do not routinely consult on ICU patients (Berry & Davidson, 2006), video and photo elicitation offer a novel method to advance interprofessional collaboration. Reports of periodontal disease and tooth loss following mechanical ventilation (Herridge et al., 2016) further underscore the

importance of collaborative interprofessional partnerships to improve care delivery during ICU treatment (Reeves et al., 2015).

Our research makes an important contribution to the study of fundamental patient care by unsettling taken-for-granted assumptions about oral care and how it can be examined. Visual methods enabled our study participants to grasp the complexity of oral care in ways that had not previously been available to them (Papoulias, 2017). This is important as international investigation has identified oral care as the most frequently omitted facet of nursing hygiene in time-pressured care settings (Ausserhofer et al., 2014). Failure to provide adequate staffing, tools, or time may inhibit the ability of nurses to address the technical and behavioral dimensions of oral care. Potentially redefining the scope of empirical research in fundamental care, our results emphasize the need for evidence inclusive of the patient experience (Leeman & Sandelowski, 2012). Visual methods may be particularly relevant in populations experiencing communicational and cognitive incapacities.

Our analysis aligns with the fundamentals of care (FOC) framework, a point-of-care nursing theory which identifies the physical, psychosocial, and relational care needs of the patient as essential to patient safety and wellbeing (Kitson, 2018). Study findings identifying unmet patient needs for comfort, guidance, and empathy highlight an ongoing tension in nursing practice between a depersonalized and mechanistic approach to care delivery and the quality and safety of care. This is important as patients ascribe iatrogenic harm to relational and physical omissions of care (Collier, Sorensen, & Iedema, 2016; Doyle, Lennox, & Bell, 2013). As enquiry into health system failures demonstrate, health contexts which prioritize efficiencies can deprive patients of their fundamental care needs, thereby yielding adverse consequences for patients and health professionals (Francis, 2013). Incorporating the fundamentals of care framework as an

analytic lens may help clinicians, educators and managers to holistically evaluate reasons for suboptimal care and identify opportunities for improvement.

This study has a number of strengths and limitations. Study strengths include extensive prior research identifying oral access difficulty as a target for exploration, employment of photo and video elicitation to facilitate in-depth discussion during interviews, and inclusion of diverse interprofessional participants. Trustworthiness and credibility were enhanced by a team-based analysis and reflexivity (Elo et al., 2014). Limitations include recruitment of participants from a single center, which may not be representative of the views and experiences of health professionals in other settings and jurisdictions. Interviews conducted by an oral health researcher may have directed participants to observe particular oral health problems. Patient case selection criteria based on prior research findings (Dale et al., 2018) may have limited attention to other challenges in the provision of oral care such as insufficient time, competing demands, or lack of adequate instruments.

CONCLUSION

In this study, interprofessional participants identified oral crowding and aversive patient responses as important determinants of oral access difficulty during video and photo elicitation interviews. Procedural pain was a key modifiable difficulty antecedent. Recommended interventions to improve oral access and manage procedural pain included verbal and non-verbal cueing, pharmacological and non-pharmacologic strategies, and interprofessional education. Participants endorsed video and photo elicitation as powerful means of exploring oral care delivery difficulty.

RELEVANCE TO CLINICAL PRACTICE

The findings of this study suggest ICU nurses require specialized training in the delivery of oral care for mechanically ventilated adults. Education should include theory and practical skills development, as well as structured opportunities to reflect on their oral care practices and patient experiences. Our study demonstrates the larger interprofessional team is often unaware of the oral health status of hospitalized patients and nursing difficulty in the delivery of oral care. In response, oral health education for the interprofessional ICU team is also important in order for clinicians to understand each other's roles and the barriers to providing oral care. It is important for ICU nurses to bring oral access and care delivery difficulties to the attention of the interprofessional team for the development of collaborative solutions.

Critically ill patients experience deterioration in oral health during ICU treatment and may experience preventative oral care as painful. Management of procedural pain in non-verbal patients may be enhanced through structured tools. For example, recent research demonstrates the Critical-Care Pain Observation Tool (CPOT) to be valid and reliable for the detection and reporting of oral-pharyngeal pain behaviours during tooth brushing and oral suctioning procedures in intubated and tracheostomised adults (Dale, Prendergast, Gélinas, & Rose, 2018). Unrelieved pain is an important source of physical and psychological distress for ICU patients and may lead to reduced health-related quality of life and post-traumatic stress disorder following hospital discharge (Puntillo et al., 2014). The introduction of a valid pain observational tool for use in non-verbal ICU patients is noted to increase pain assessments and appropriate use of analgesia (Rose, Haslam, Dale, Knechtel, & McGillion, 2013).

The fundamentals of care framework draws special attention to the influence of context on nursing delivery of preventative oral care (Kitson, Munthlin Athlin, & Conroy, 2014). Those

working in clinical leadership roles can use the framework to predict nursing capacity to meet patient needs and diagnose oral care delivery problems. The research evidence demonstrates a clear link between missed oral care and the quality of the work environment, including inadequate nursing staffing and the requirement for nurses to carry out non-nursing tasks (Ausserhofer et al., 2014). Nurses may omit oral care as it is perceived as a time-intensive activity or one in which the time requirement is unpredictable due to anticipated technical and behavioural difficulty. As patient outcomes including length of stay and mortality are negatively impacted by missed care, nursing leadership is urgently needed in this domain (Recio-Saucedo et al., 2018).

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Table 1. Clinician characteristics

Characteristic	ICU Clinicians (n =9)	Non-ICU Clinicians (n=9)
	n (%)	n (%)
Female	9 (100)	8 (88)
Highest Education		
Diploma	0	2(22)
Baccalaureate	7 (77)	3 (33)
Masters	0	4 (44)
Doctorate	2 (22)	0
Profession		
Registered Nurse	2 (22)	1 (11)
Physician	2 (22)	1 (11)
Allied Health/Therapist	5 (55)	3 (33)
Dentist/Hygienist	0	4 (44)
Professional Experience		
≤ 5 years	0	1 (11)
6-10 years	2 (22)	4 (44)
11-20 years	6 (66)	2 (22)
> 20 years	1 (11)	2 (22)

Table 2. Oral Access Difficulty Word Frequencies and Participant Quotes

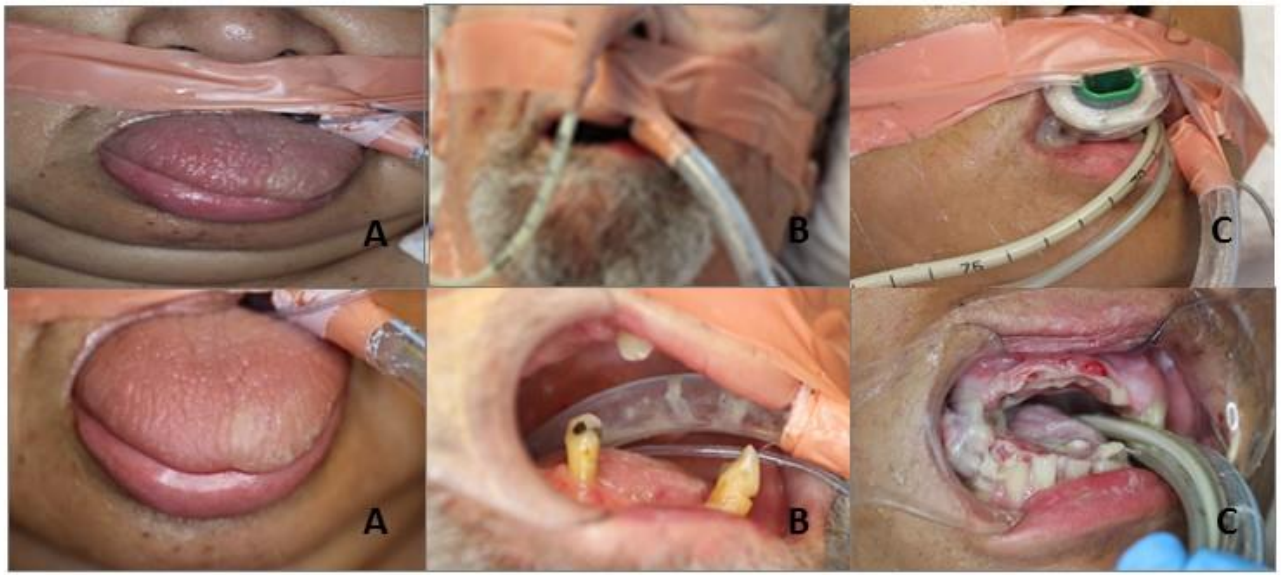
Difficulty Categories	Word Frequency		Case A: Oral Crowding	Case B: Reactive Behaviors	Case C: Composite
	ICU Group	Non-ICU Group			
Interprofessional descriptions and consequences of oral access difficulty	Biting (429) Tubes (286) Fighting (141) Responsive (77) Difficult (82) Access (68) Crowded (45) Infection (27) Pneumonia (10) Periodontitis (1) Recession (0) Gingivitis (0) Apraxia (0) Macroglossia (0) Caries (0) Xerostomia (0)	Biting (344) Tubes (163) Fighting (159) Responsive (106) Difficult (66) Access (61) Crowded (33) Infection (23) Pneumonia (18) Periodontitis (4) Recession (7) Gingivitis (4) Apraxia (8) Macroglossia (3) Caries (4) Xerostomia (4)	*"A crowded mouth; it's her tongue that's crowding." [DENT]* *"Really overcrowded; it's overwhelming." [RN]* *"Risk is drying out [the tongue] because it's on the outside. And then risk of infection and breakdown." [RN]*	*"Adversely responsive." [OT]* *"A fighter; they're biters." [RN]* *"It looks dry and infected. [DENT]*	*"I can't imagine how they would get all that done with the crowding." [OT]* *"You can't even go in with the Yankauer." [RT]* *"I'd be worried about those teeth and infection hiding in the gums." [DH]*
Modifiable antecedents to oral care difficulty	Pain (158) Technique (31) Injury (39) Uncomfortable (67) Pressure (37) Gag (40) Dry (37) Grimace (26) Reflex (15) Discomfort (34) Dehydration (40) Ulcer (33) Inflamed (21)	Pain (121) Technique (54) Injury (34) Uncomfortable (43) Pressure (30) Gag (20) Dry (93) Grimace (8) Reflex (40) Discomfort (18) Dehydration (40) Ulcer (11) Inflamed (4)	*"And her eyes are watering now, maybe because of the pain?" [PT]* *"The deeper suctioning, it's eliciting a cough. She's the most uncomfortable at this point in the clip." [OT]*	*"He is grimacing and I think he was maybe trying to withdraw from the pain." [RN]* *"I was thinking that he would be aversive to things in his mouth because of the dryness." [DH]* *"He's got periodontal disease there. So his*	*"You're telling me about biting issues that I have literally you know never heard of." [MD]* *"The patient's now awake and biting down, because of pain or whatever. There are sores on the tongue and lots of inflammation of the gums." [SLP]*

	Localize (13) Blind entry (8) Delirium (4)	Localize (13) Blind entry (7) Delirium (17)	*"I think the [oral care] was rushed." [RN]*	*mouth might be tender to begin with." [PT]*	*"As a physician, until we see this, we really have no clue about oral care problems" [MD]*
Recommendations to improve oral care delivery	Sedation (123) Prop/Bite Block (57) Training (41) Medication (16) Moisture (15) Explanation (23) Communicate (25) Assessment (33) Gentle (17)) Guidance (33) Pace (4) Analgesic (4) Anaesthetic (4)	Sedation (42) Prop/Bite Block (51) Training (31) Medication (12) Moisture (28) Explanation (17) Communicate (66) Assessment (53) Gentle (9) Guidance (54) Pace (9) Analgesia (6) Anaesthetic (1)	*"I actually explain [the procedure] to them" [RN]* *"An explanation to prompt the patient this is what's going to happen next." [SLP]* *"If they are going to be agitated, you need to give sedation; maybe do it with another procedure that needs sedation." [RT]*	*"If he's in pain can we give something to make the mouth numb?" [DT]* *"Well it makes sense to slow down and be very gentle "[DENT]* *"We really do trial and error. And put it in the care plan you know for other people to know and sort of to build it as a goal."[OT]*	*"Some nurses use [a suction tool] to prop it open so they can brush." [RN]* *"Something to lubricate the tongue so it doesn't become dry, cracked, ulcerated, etc." [PT]* *"I've seen this tool you use to like prevent the patient from biting." [MD]*
Perceived benefits of video and photographic data	Video (121) Understand (38) Learning (30) Photographs (51) Noticed (26) Surprised (26) Observed (24) Procedures (18) Movement (18) Detail (10)	Video (99) Understand (33) Learning (43) Photographs (27) Noticed (29) Surprised (19) Observed (24) Procedures (34) Movement (38) Detail (8)	*"Like, you can condense a 500-page book into a 20 minute video." [RT]* *"It's very powerful. I think it's more powerful than just talking about things." [RN]*	*'"The still shots give a good diagnostic picture." [SLP]* *"You could see the difference responses from one patient to the other. None of them reacted exactly the*	*"I think the videos offer more in terms of like the dynamics. Seeing it happen live." [SLP]* *"So I think this is basically like way better learning; rather than you know just studying it from a textbook." [PT]*

	Beneficial (7) Behavior (9) Appropriate (4)	Beneficial (3) Behavior (35) Appropriate (6)	*"I think it's an excellent tool. It's the most experiential type of learning. It's the most real type of learning." [OT]*	*same way to mouth care." [MD]* *"You can see the patient is communicating with his body movement, his hand movement." [OT]*	*"I like it because it feels like I'm there." [Occupational Therapist]*

DENT = Dentist; DH = Dental Hygienist; DT = Dietitian; MD = Medical Doctor; OT = Occupational Therapist; PT = Physiotherapist; RN = Registered Nurse; RT = Respiratory Therapist; SLP = Speech Language Therapist

Figure 1. Patient Cases



Images used with permission. (A) Technical difficulty [oral crowding]; (B) Behavioral difficulty [responsive behaviors]; (C) Combination difficulty [oral crowding and responsive behaviors].

Figure 2. Video Image

Image used with permission.